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THE CHOICE AND TIMING OF FOREIGN MARKET ENTRY UNDER UNCERTAINTY

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Abstract
This paper considers the minimally required payoffs to different means of foreign direct investments (FDI), where the investment is irreversible and payoffs are uncertain. It is found that the critical profit level at which it is optimal to create a joint venture (JV) increases with (i) the share of the TNC in the JV, (ii) the uncertainty about the payoffs, and (iii) the difference in taxation between the TNC's government and the host country's government. Moreover, cooperative JVs will be formed sooner than non-cooperative JVs. Under non-cooperation, the optimal share of the MNE increases with uncertainty, and decreases with taxation. Under cooperation, the partners intend to minimize the share. The results obtained partially explain recent empirical findings on Chinese JVs.

Keywords: Joint Venture, Uncertainty, Irreversible Investment, Nash Bargaining, Tax Policy.

JEL-Codes: D92, F21, G31, L20

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1. Introduction

Most existing literature on foreign direct investments (FDI) and other entry strategies in foreign markets deals with static models for investment in a certain environment. As a result, the timing of entry and the relation of uncertainty with the choice of entry mode has been left out of consideration. The typical entry modes include export, licensing agreements, joint venture and wholly owned subsidiary. To investing firms entering new or unstable markets the choice of entry strategy is of paramount importance, as the different entry modes represent varying levels of control, commitment and risk (Tse, Pan and Au; 1997).

This paper focuses on the choice and timing of entry under uncertainty. Starting from the full commitment case under FDI, it moves to more flexible entry modes of joint venture formation, licensing and, finally, exporting. The first approach to analyze the timing of FDI under certainty conditions is given by Buckley and Casson (1981). They model the choice among licensing, exporting, and foreign investment as one leading from low toward high fixed cost of investment and relate the timing of entry mode to the growth of the market.

The introduction of uncertainty and the concept of option analysis to the analysis of market entry decisions was first established by Dixit (1989) and Kogut (1991). Dixit shows that uncertainty affects the timing of market entry. Kogut analyzes a joint venture as an option to acquire or expand. Most recently, Rivoli and Salorio (1996) and Chi and McGuire (1996) discuss the strategic perspectives on the timing of investment and the choice of market entry respectively.

When the TNC can undertake the investment in the foreign itself, the usual analysis follows the theory developed by McDonald and Siegel (1986) and summarized by Dixit and Pindyck (1994). In this case, the company is vertically integrated, and does not need to rely on a local partner. In many circumstances, however, the company has not the capabilities or the legal right to undertake the investment itself. Moreover, it is shown that it is not always optimal to solitary undertake the project. Allowing for a more general approach , the analysis is extended by considering a transnational corporation (TNC) that has a monopoly over setting up a joint venture (JV) with a local partner. It is assumed that the TNC provides the knowledge and technology for the business, while its local partner builds the production plant and the distribution network. In order to establish this investment, the local partner has to incur a sunk investment cost. For both partners, the payoffs to the investment are uncertain. The paper considers contractual joint venture where firms are forced to work together, and as a result optimize profits in a non-cooperative way, as well as cooperative joint ventures. The distinction is important as it covers different features of joint venture realities in the developing markets of Eastern Europe and China (Tse, Pan and Au; 1997). In analyzing joint venture formation, the effects of taxation and ownership restrictions are explicitly taken into account.

Our research about cooperative joint venture formation is most closely related to the work of Svesjnar and Smith (1984). They derive optimal transfer prices of the input of the partners under Nash bargaining. They show that levying a higher tax on the TNC's profits than on the local firm's profits result in a zero share of the TNC or lead to transfer prices such that the declared profit is zero. Our approach differs in that the profits follow a stochastic process. Moreover, we focus on the timing of joint venture formation. By introducing uncertainty and the option value of waiting to invest, the basic result of Svesjnar and Smith that the partners want to minimize the amount of profit going to the government of the host country still holds. Their hypothesis that "most of our results remain essentially the same when uncertainty is introduced under risk neutrality" is invalid when the cost of investment is irreversible. It is shown that uncertainty shifts wealth from the TNC to the local partner. The intuition behind this is that the local partner has a tax advantage in comparison with the TNC. This advantage increases with uncertainty since the critical value at which investment is optimal increases with uncertainty, and the tax is proportional to the profits.

The paper is organized as follows. Section 2 discusses the critical value at which it is optimal to invest when the TNC sets up a wholly-owned subsidiary. In section 3, the trigger value is discussed for non-cooperative JVs in three different settings: (i) the local partner acts as monopolist; (ii) the TNC has a monopoly while there is perfect competition among local partners; and (iii) there is bilateral power and imperfect information about the payoffs and the cost of the project. Section 4 examines the investment rules for JVs under cooperation in a Nash-bargaining framework. In section 5, the choice between exporting, JV and FDI is considered. Finally, section 6 draws some results on the choice and timing of foreign market entry strategy under various environmental and regulatory conditions.

2. Wholly-Owned Subsidiary

Suppose that the profits of undertaking the investment, π, follow a geometric Brownian motion with drift μ and standard deviation σ. Mathematically expressed,

$$d\pi = \mu\pi dt + \sigma\pi dz \tag{1}$$

where z is a Wiener process, μ denotes the drift and σ denotes the standard deviation. The value of the investment project is given by

$$V(t) = E\left[\int_t^\infty \exp(-\rho(s-t))\pi(s)ds\right] = \frac{\pi(t)}{\rho-\mu} \tag{2}$$

subject to the condition that the appropriate discount rate (ρ) exceeds the drift rate of the pre-tax profits. Since V is a constant multiple of π, V also follows a geometric Brownian motion with a drift of μ and a standard deviation of σ, so

$$dV = \mu V dt + \sigma V dz \tag{3}$$

When profits are taxed by the foreign government at rate $0 \le \tau_f < 1$, profits at time t are given by $(1-\tau_f)\pi(t)$ and the value of the project at time t changes into $(1-\tau_f)V(t)$. The irreversible cost of investment for a wholly-owned subsidiary is denoted by c_w. From the theory of investment under uncertainty, it is well-known that giving up an irreversible cost of investment of c_w in return for the project value is optimal when V exceeds a certain critical value V*. The critical value can be expressed as (e.g. Dixit and Pindyck, 1994)

$$(1-\tau_f)V^* = \tfrac{\beta}{\beta-1}c_w, \tag{4}$$

where

$$\beta = -\left(\mu - \tfrac{1}{2}\sigma^2\right)/\sigma^2 + \sqrt{\left(\left(\mu - \tfrac{1}{2}\sigma^2\right)/\sigma^2\right)^2 + 2r/\sigma^2}\ . \tag{5}$$

Setting up a wholly-owned subsidiary has the disadvantage of paying the tax levied on foreign firms and of lacking the knowledge required for optimally exploiting the company's competitive advantage abroad. Moreover, the critical value can be substantial when the difference in taxation between the TNC and a local partner is considerable. The next sections show that the trigger value of investment is lower for JVs, so, when the project value is rather low, a company prefers to start a JV to setting up a wholly-owned subsidiary.

3 Non-Cooperative Joint Ventures

3.1 Non-Cooperative Joint Ventures: Local Monopoly

It is assumed that the local partner and the TNC have perfect information about the sunk outlays that are required to enter the industry at an efficient level of production, and the expected profits that are generated by entry. The profits of the TNC can be written as

$$\underset{\delta,\varphi,V^*}{Max}(1-\tau_o)(\delta(1-\tau)V^* + \varphi - X)\left(\tfrac{V}{V^*}\right)^{\beta} \tag{6}$$

where τ stands for the relative difference in the tax rate levied by the foreign government and the tax rate τ_0 levied by the government of the TNC's country of origin[1], φ is the transfer price from the local partner to the TNC as compensation for the TNC's input of knowledge and technology, and δ is the profit share of the TNC. When the TNC maximizes its profits, the trigger value of investment is given by

$$\delta(1-\tau)V^* = \tfrac{\beta}{\beta-1}(X-\varphi). \tag{7}$$

The payoff to the local partner, G, is given by the transfer price X minus the sunk cost, c_j, required for undertaking the investment, plus the share in the JV's profits.

Since the timing of investment depends on the reaction of the TNC upon the transfer price of the local partner, G is given by[2]

$$\underset{X}{Max}\, E\left[\int_0^{\infty}\left(X-\varphi-c_j+(1-\delta)V^*\right)f(X,t)\exp(-rt)dt\right] \tag{8}$$

[1] $1-\tau = \frac{1-\tau_f}{1-\tau_o}$

[2] Since τ_o does not affect the investment decision, but merely renders part of the profits of the TNC and local partner to the government of the local partner, it is omitted in the remainder of the paper.

s.t.

$$f(X,t)=\begin{cases}1 & \mathrm{V(t)} \geq V^* \\ 0 & \mathrm{V(t)} < V^*\end{cases} \tag{9}$$

where r is the appropriate discount rate, and V* is the critical value of the payoff to the JV at which the TNC will set up the JV, as defined in (7). Setting a high $\hat{X}$ by the local company induces a high return, but this return will be achieved at a later date. A lower $\hat{X}$ implies a lower return, but obtained at an earlier date. Using a standard indicator function 1_A which takes the value 1 on the set A, and 0 otherwise, the maximization problem can be rewritten as

$$\underset{X}{Max}\left(X-\varphi-c_j+(1-\delta)V^*\right)E[\exp(-rT)]1_{[V<V^*]}+\left(X-\varphi-c_j+(1-\delta)V^*\right)1_{[V\geq V^*]} \tag{10}$$

where $T=\min_t\{V(t)=V^*\}$, and $E[\exp(-rT)]=\left(\frac{V}{V^*}\right)^\beta$; see Harrison (1990). Hence, the equation turns into

$$\underset{X}{Max}\left(X-\varphi-c_j+(1-\delta)V^*\right)\left(\tfrac{V}{V^*}\right)^\beta 1_{[V<V^*]}+\left(X-\varphi-c_j+(1-\delta)V^*\right)1_{[V\geq V^*]}. \tag{11}$$

Solving for X, we find that

$$\hat{X}=Max\left[\varphi+\tfrac{\beta\delta(1-\tau)}{\beta-\delta+\delta\tau-\beta\delta\tau}c_j,\varphi+\tfrac{\delta(1-\tau)(\beta-1)}{\beta}V\right]. \tag{12}$$

When the first term in the Max[.,.] operator is chosen, $V<V^*\left(\hat{X}\right)$, and postponement is optimal. When the second term is chosen, $V\geq V^*\left(\hat{X}\right)$, and immediate investment is optimal. Under a non-equity JV (i.e. δ=1), the first term in (12) reduces to $\frac{\beta}{\beta-1}c_j$. This means that the local company wants to have at least the same relative after-tax markup as the TNC. This establishes an important difference with the results obtained in the previous paragraph. Even though the investment outlays are non-stochastic, the TNC pays at least a markup of only $c_j/(\beta-1)$ in addition

to the local set-up cost. In the case of a wholly-owned subsidiary, it would pay no markup. Hence, the more uncertainty about the benefits of the project, the more beneficial it is to create a wholly owned foreign company in comparison with a JV. The equation also shows that the local partner wants full compensation for the transfer price of the technology input.

The critical value at which it is optimal to create the JV is the value of V for which the local partner is indifferent between postponement and immediate investment. So, V* is the value of V for which the first term in the Max-operator in (12) equals the second term. Hence,

$$V^* = \frac{\beta^2}{(\beta-1)(\beta-\delta+\delta\tau-\beta\delta\tau)} c_j . \tag{13}$$

When V≥V*, the local company will relate its transfer price to V, and use its market power to gain a value in addition to the required markup over the sunk outlays.

Considering the optimal profit share for the MNE, we can substitute (13) and (12) into (6) and maximize with respect to δ and φ. Since the payoff to the MNE is independent of φ, the maximization problem can be written as

$$\underset{\delta}{Max}\, \omega(\beta-\delta+\delta\tau-\beta\delta\tau)^{\beta-1}\delta \tag{14}$$

where ω is a constant that is independent of δ. The optimal share[3] is the positive root of a quadratic equation that is obtained from the first order condition. We assume a maximum profit share of 1. Thus, the optimal profit share is

$$\hat{\delta} = Min\left[\left\{\tau-1+\sqrt{(\tau-1)^2+4\beta/(\beta-1)}\right\}\Big/2\beta, 1\right]. \tag{15}$$

[3] Nakamura and Yeung (1994) provide a principal-agent model where the optimal share of the TNC is a trade-off between the benefit and cost (agency cost and technology spillover) of increased ownership. Nakamura and Xie (1998) propose a model where both partners negotiate a contract that specifies the shares. The dynamic model in this paper can be extended accordingly to account for agency cost and technology spillover.

Figure 1 illustrates the optimal share of the TNC in the JV for different combinations of β and τ.

-------------------------------------- Insert figure 1 about here ---------------------------------

It is shown that higher uncertainty -and hence a lower β- leads to a higher optimal profit share of the TNC. Obviously, higher uncertainty thus results into a lower transfer price to the local partner. Taxation has a smaller impact on the optimal profit share. The figure illustrates that a higher tax leads to a lower profit share of the TNC.

The intuition behind this result stems from the basic results in the theory of irreversible investments: higher uncertainty yields a higher value of waiting to invest. Demanding a higher profit share results in a higher trigger value of investment, but also a higher payoff. Taxes have an opposite effect on the optimal share, since they are exogenous. Higher uncertainty leads to a higher trigger value, and hence to a higher payoff to the government. By setting a lower profit share as well as a lower transfer price, the TNC can decrease the payoff to the government. When taxes increase, the TNC will be more inclined to decrease V*.

Let F denote the option value of the TNC. First, suppose $\hat{X} = \frac{\beta\hat{\delta}(1-\tau)}{\beta-\hat{\delta}+\hat{\delta}\tau-\beta\hat{\delta}\tau} c_j$, i.e. there is a value in waiting to set up the JV. Then, $F = E[\exp(-rT)]\left(\hat{\delta}(1-\tau)V^* - \hat{X}\right)$, and $G = E[\exp(-rT)]\left(\left(1-\hat{\delta}\right)V^* + \hat{X} - c_j\right)$. The functions can be written as $F = V^{\beta} c_j^{1-\beta}\left(\beta - \hat{\delta} + \hat{\delta}\tau - \beta\hat{\delta}\tau\right)^{\beta-1} \beta^{-\beta}\left(\frac{\beta-1}{\beta}\right)^{\beta-1} \hat{\delta}(1-\tau)$, and $G = V^{\beta} c_j^{1-\beta}\left(\beta - \hat{\delta} + \hat{\delta}\tau - \beta\hat{\delta}\tau\right)^{\beta} \beta^{-\beta}\left(\frac{\beta-1}{\beta}\right)^{\beta} \frac{1}{\beta-1}$. Second, suppose $\hat{X} = \frac{\hat{\delta}(\beta-1)(1-\tau)}{\beta} V$.

Then, an immediate creation of the JV is optimal, and $F = \frac{(1-\tau)\hat{\delta}}{\beta} V$, and $G = V - c_j - \frac{(1-\tau+\tau\beta)\hat{\delta}}{\beta} V$. The difference between $V - c_j$ and $F + G$ is received by the government, and equals $\tau\hat{\delta}V$.

From real option theory, it is well-known that β, with β>1, decreases with uncertainty. This gives some interesting insights. As uncertainty decreases, the local partner receives more of the expected profits. When uncertainty goes to zero, the TNC does not require a markup at all, and will be satisfied with a JV that has a zero net present value. The local company will get the full difference between the value of the investment and the irreversible cost of setting up the JV. This result is also reflected in the formulas. Since β goes to infinity as σ goes to zero, $F = 0$, and $G = \left(1 - \tau\hat{\delta}\right)V - c_j$. Moreover, equation (15) tells that the optimal share is zero, when uncertainty is zero. This, again, reflects the power that the local company has over the decision: Though the TNC makes the investment decision, the local partner can gain all excess profits.

Depending on the restrictions on the contractual agreement, there may exist two suboptimal situations; (i) The government imposes that the TNC must at least pay the cost of the input of the local company, or the local company cannot finance the cost (in particular in developing countries), i.e. $X \geq c_j$; and (ii) The government imposes a maximum share of the MNE in the profits of the JV.

Case 1. The restriction on δ is that $X \geq c_j$, or $\beta\delta(1-\tau) \geq \beta - \delta + \delta\tau - \beta\delta\tau$, so

$$\delta \geq \frac{\beta}{\beta+1-\tau} \tag{16}$$

which induces a minimum share for entry, required by the TNC. Under infinite uncertainty and no taxes, the minimum share is one half. Under certainty, the TNC demands the full share and pays the TNC the cost of investment. The minimum share is decreasing with uncertainty and increasing with the tax rate. Since the *optimal* share is increasing with uncertainty and decreasing with the tax rate, the deviation from the optimal share can be substantial when uncertainty about future profits is low. In this case, the optimal share for the MNE is low, while its minimum share is high.

Substituting the minimum share into (13) gives

$$V^* = \frac{1-\tau+\beta}{(\beta-1)(1-\tau)} c_j \tag{17}$$

So the threshold decreases in comparison with the critical value derived for a joint venture without a contractual share. When $c_j = c_w$, the threshold in (17) exceeds the one of (4). A JV will only be preferred when $c_j < \frac{\beta}{1-\tau+\beta} c_w$.

Case 2. When the government imposes a maximum share by the MNE in the JV profits, the results are opposite to the previous findings. A maximum share leads to inefficiency when the MNE requires a high profit share. This occurs when uncertainty is relatively high and taxes are relatively low.

3.2 Non-Cooperative Joint Ventures: Monopoly for TNC, Competition among Local Partners

The local monopoly is not attractive for the TNC, especially when the expected profits of the JV are substantial. This paragraph takes a look at another extreme: there is perfect competition among the local partners. Under perfect information, perfect competition drives the compensation for the investment outlays down to its cost. Hence, by substituting $X - \varphi - c_j + (1-\delta)V^* = 0$ in equation (7), the trigger value of setting up the JV is given by

$$V^* = \frac{\beta}{\beta-\delta+\delta\tau-\beta\delta\tau} c_j \,. \tag{18}$$

Comparing the critical values in (13) and (18), we find that the critical value under a local monopoly is $\beta/(\beta-1)$ times higher than the critical value when there is competition among the local partners. Since the sunk outlays for setting up a joint venture will in general be less than the cost for setting up a wholly-owned subsidiary, the trigger value in (18) is less than the trigger value in (4).

3.3 Non-Cooperative Joint Ventures: V and c_j as Strategic Variables

In the previous extreme cases, there is complete and common knowledge about V and c_j. Since the local company knows V, a local partner acting as a monopolist can charge the excess profits of the JV. In the other case, where the TNC knows c_j, the TNC profits from perfect competition among local partners. This paragraph extends the model by making V and c_j strategic decision variables of the TNC and the local partner, respectively. In general, the TNC does not know about the true cost of the local partner in setting up the JV, and the local partner does not know the expected profits of the JV.

The JV will be set up as soon as $V \geq V^*$ where V^* consists of the minimal required monopolist profit of the local company and the minimal required pre-tax monopoly profit of the TNC, i.e. V^* is the value as expressed in equation (13), with δ defined in (15). The difference with the previous cases lies in the distribution of the excess profits, i.e. $V-V^*$. While the sequential monopoly renders all excess profits to the local partner, and the perfect competition among local partners renders all excess profits to the TNC, with imperfect information, the excess profits are shared between the local partner and the TNC. For ease of exposition, suppose there are no taxes, and there is a zero share of the local partner. With symmetric information about V and c_j, the partners wait with undertaking the venture until V=V*. At this moment, the local partner gets $X = \frac{\beta}{\beta-1} c_j$, and the TNC receives $V = \frac{1}{\beta-1} X$.

We show that the extended bilateral model does not raise the critical value of the profits for setting up the JV. Under the new assumptions, the TNC will be inclined to report a lower value of the investment, while the local company tends to report a higher cost. The local company will only report the true cost as long as the value reported by the TNC is relatively low. To be more precise, c_j is reported when investment is not optimal, given the reported value of the project, i.e. $\hat{V}$ does not exceed the double markup over the construction cost (the markup required by the TNC as well as the markup required by the local company). Setting a higher (lower) value than c_j leads to a later (earlier) realization of the cash flows, and is from equation (12) not optimal. When the reported V exceeds the double markup, the local company will set c_j so that the company just tends to invest. So, the local company's optimal cost setting $\hat{c}$ conditional on the TNC's optimal report of the value it receives from investing, $\hat{V}$, is

$$\hat{c}\middle|\hat{V} = Max\left[\left(\frac{\beta-1}{\beta}\right)^2 \hat{V}, c_j\right]. \tag{19}$$

The TNC's optimal value setting is V as long as investment is not optimal, given the reported cost of construction. When investment appears to be optimal given the reported cost of construction, i.e. $V \geq \left(\frac{\beta}{\beta-1}\right)^2 \hat{c}$, the TNC will report the smallest value such that the TNC invests, i.e. $\hat{V} = \left(\frac{\beta}{\beta-1}\right)^2 \hat{c}$. When investment is not optimal yet, the TNC also reports the true value. Hence,

$$\hat{V}|\hat{c} = Min\left[\left(\tfrac{\beta}{\beta-1}\right)^2 \hat{c}, V\right]. \tag{20}$$

Figure 2.1 and 2.2 show the optimal cost and value setting of the local partner and TNC for a relatively high V and a relatively low V. For high V, i.e. $V \geq \left(\tfrac{\beta}{\beta-1}\right)^2 c$, immediate investment is always optimal.

-------------------------------------- Insert figure 2.1 about here --------------------------------

In figure 2.1, we have V=12, c=2 and β=2, leading to V*=8. The reaction functions of the partners overlap at $\hat{c} = \frac{1}{4}\hat{V}$ for $8 \leq \hat{V} \leq 12$. This line yields the Nash equilibria. There is no need for the TNC to report a lower value of the JV, and no need for the local company to report higher cost. The payoff to the TNC (local partner) ranges from 8 (2) when $(\hat{V}, \hat{c}) = (8,2)$ to 6 (4) when $(\hat{V}, \hat{c}) = (12,3)$. In a sequential monopoly, the payoffs equal the latter payoffs; i.e. for the TNC the payoff equals the worst outcome of the Nash equilibria, and for the local partner the payoff equals the best outcome.

-------------------------------------- Insert figure 2.2 about here --------------------------------

In figure 2.2, the same parameter values for c and β are used as in figure 2.1, but the value of the project decreases to V=6. In this case, postponement is optimal. The reaction curves intersect at a unique Nash equilibrium: $\hat{V} = 6, \hat{c} = 2$. In this case, the companies do not bargain over excess profits. Both partners recognize that reporting the true value leads to the most rapid realization of the pie consisting of the minimum required markup for both partners, and hence to the biggest pie.

The solution under non-cooperation is far from efficient, as it leads to a very high threshold for undertaking the JV. The next sections will show how cooperation between both partners lowers the trigger value of investment. It is shown that the trigger value can even be lower than the threshold required by a vertically integrated company.

4 Cooperative Joint Ventures

Let γ_v denote the bargaining power of the company and γ_x the bargaining power of the local partner. The bargaining powers are normalized so that they sum up to unity ($\gamma_v+\gamma_x=1$). The Nash bargaining solution is the outcome to the following maximization problem:

$$\max_{\delta,V^*,X}\left\{\left(\delta(1-\tau)V^*+\varphi-X\right)\left(\tfrac{V}{V^*}\right)^{\beta}\right\}^{\gamma_v}\left\{\left(X-\varphi-c_j+(1-\delta)V^*\right)\left(\tfrac{V}{V^*}\right)^{\beta}\right\}^{\gamma_x}. \tag{21}$$

Setting the partial derivative with respect to X equal to zero gives

$$(1-\tau)\delta V^*+\varphi-X=\gamma_v\left(V^*-c_j-\tau\delta V^*\right), \tag{22}$$

and also

$$(1-\delta)V^*+X-\varphi-c_j=\gamma_x\left(V^*-c_j-\tau\delta V^*\right) \tag{23}$$

The equations reflects that the payoff to the TNC is the product of its bargaining power and the total payoff. Similarly, it follows that the payoff to the local company also equals the product of its bargaining power and the total payoff to the investment.

Setting the partial derivative with respect to V* equal to zero and substituting (22) and (23) in the resulting expression gives

$$V^* = \frac{\beta}{(\beta-1)(1-\delta\tau)} c_j . \tag{24}$$

Substituting (22), (23), and (24) into (21), it is found that the payoff to the cooperative JV is $c_j/(\beta-1)$. From (24), this payoff is realized at the earliest moment when δ - and hence V*- is minimized, i.e. δ=0. Hence, the partners want to invest as soon as possible, and give up any additional value of waiting by demanding a higher share. The result of this policy is that the trigger value in (24) is lower than the trigger value in (4), even when the costs of setting up the JV are the same for the local partner and the TNC. The reason behind this result lies in the possibility of tax evasion by the TNC in a cooperative JV. The finding is consistent with Luo (1996) who suggests that the profitability[4] of a wholly-owned subsidiary in China is significantly higher than the profitability of a Chinese JV.

The result crucially depends on a positive differential taxation. When τ=0, the derivative with respect to δ yields the same equation as the derivative with respect to X, which means that there is no explicit solution for δ and X. Any combination of the variables satisfying (22) and (23) is optimal. Consider τ>0. From (22), it follows that

$$\hat{\delta} = \frac{X - \gamma_v c_j + \gamma_v V^*}{(1-\tau-\tau\gamma_v)V^*} . \tag{25}$$

The results are in line with Fagre and Wells (1982) and Lecraw (1984) who suggests a positive relation between the bargaining power and the percent equity ownership. They explore the relationship between the characteristics of a multinational enterprise (MNE) and the percent equity ownership that the MNE achieves in the foreign country. It is found that firm-specific advantages such as leadership in technology, production, marketing, finance, and management are critical for the bargaining power

[4] more specific, the operating profit margin. Note that a higher V* corresponds with a higher profitability.

of the MNE. The bargaining power of the foreign company depends on the country-specific advantages of the firm's home country, such as natural resources, market size, income level, and factor costs.

The analysis of a minimum share imposed by the government is straightforward. With a minimum share, the optimal share is exactly the minimum share imposed by the government. The higher the minimum share, the longer the partners will wait with setting up the JV. Next, we distinguish between two other cases: (i) $X \geq c_j$, and (ii) no restriction on δ.

Case 1. $X \geq c_j$. Equation (25) shows that the share of the TNC is minimized when $X=c_j$. Substituting $X=c_j$, and $V^* = \frac{\beta}{(\beta-1)(1-\delta\tau)} c_j$ in (25), and rearranging gives

$$\hat{\delta} = \frac{\beta+\gamma_v-1}{\beta-\tau+\tau\gamma_v-2\beta\tau\gamma_v} \tag{26}$$

By substituting (26) in (24), the critical value can now be written as

$$V^* = \frac{\beta-\tau+\tau\gamma_v-2\beta\tau\gamma_v}{(1-2\tau\gamma_v-\tau)(\beta-1)} c_j . \tag{27}$$

Case 2. In the absence of restrictions on the shares, licensing of technology is optimal[5]. Since both parties want to minimize the share of the MNE, they prefer a zero share of the MNE. Therefore, from (25), the transfer price is negative and equals $\gamma_v\left(c_j - V^*\right)$. Substituting δ=0 in (27) and the resulting equation in the transfer price gives

$$X = -\frac{\gamma_v c}{\beta-1} . \tag{28}$$

The transfer price, i.e. the payment by the local company to the MNE in exchange for the use of the technology, is increasing in uncertainty, the bargaining power of the MNE and the cost of the investment. So, the larger the investment project, the higher

[5] See Horstmann and Markusen (1987) for a static model of the tradeoff between licensing and FDI.

the price of the license. Note that the critical value at which investment takes place is equal to the trigger value of investment for a local company that owns the investment opportunity and has the required knowledge of technology.

Licensing of technology without jointly exploiting the project deters investment since the cost of the license is irreversible and accompanies the irreversible cost of installing the project. Hence, the trigger value of investment decreases.

5. Exporting versus FDI

The previous analysis ignored the possibility that the TNC can also export to the foreign market. Because of different competitive advantages, the costs of the contribution by the local company is different from c_j and c_w, say c_e. In the case of exporting, the company does not make an irreversible commitment abroad. Hence, there is no option value in waiting, and the company will export as soon as the benefits of exporting are higher than the costs, i.e. $V>c_e$. In the case of FDI, the local company will require an option value of waiting in addition to the costs of FDI. The company will only undertake FDI when the value of waiting to undertake the investment is zero. Besides the option value that the local company requires, it follows from the previous analysis that there are circumstances in which the foreign company also charges a markup. So, another reason for exporting is to prevent a markup when the foreign government enforces restrictions on the joint venture which preclude a Pareto-optimal solution.

Disadvantages of exporting include (i) a competitive disadvantage about the required input, and (ii) transportation costs. Both disadvantages lead to a c_e that is higher than c_w and c_j. It depends on the restrictions that the foreign government imposes, the competitive advantages of the foreign company, the transportation costs, the uncertainty about future payoffs, and the interest rate whether exporting or FDI is the optimal strategy for the local company. Less restrictions from the foreign government, more competitive advantages of the foreign company, higher transportation costs, less uncertainty about future payoffs, and lower interest rates all favor FDI.

------------------------------------ Insert figure 3 about here -------------------------------

Figure 3 summarizes the differences between the trigger values of a non-contractual joint venture, a wholly-owned subsidiary, a contractual joint venture, and exporting. The share of the MNE within the JV is unrestricted. The cost of investment for the JV (c_j), the WOS (c_w), and exporting (c_e) are 1, 1.5 and 2.25, respectively. The threshold for exporting is independent of uncertainty, and obviously equals 2.25. The thresholds for a non-contractual JV and a WOS exceed the one of a contractual JV for all values of β. Given the possibility of a contractual JV, the MNE will export when (i) uncertainty is high, and (ii) V does not exceed the trigger value of a cooperative JV. When uncertainty is relatively low, the MNE can benefit from a contractual JV by the lower cost and the profit sharing with the local partner. Without the possibility of a contractual JV, the MNE will export when (i) uncertainty is high, and (ii) V does not exceed the trigger value of a non-contractual JV of a WOS. When V rises, it first hits the investment threshold of a non-contractual JV when uncertainty is relatively low, while V first hits the trigger value of a WOS when uncertainty is relatively high.

6. Conclusion

Compared to the fixed timing of entry in Buckley and Casson (1981), in our model, the trigger value of investment is lower for licensing under Nash bargaining than for a JV with or without contractual share. Without cooperation, licensing is rare since the local company has a value in waiting to invest. Contrary to licensing under bargaining where the local company has a lower bargaining power and hence pays more for the license, an increase in the irreversible cost of the license without bargaining results in a much higher investment threshold. Since exporting yields no option value of waiting to invest (only the variable cost is higher), it depends on the variable cost which of both is preferred. This result is consistent with the analysis of Buckley and Casson.

When profits of the JV are differentially taxed for the local company and the TNC with a higher tax for the TNC, it is shown that the lowest trigger value of investment is reached when the local company can invest without the TNC or when the local company can license the technology of the TNC. Generally, a local company does not possess the knowledge to undertake the investment opportunity. Licensing requires a large commitment by the local firm. A JV has the next lowest critical value of investment. As a result of differential taxation, it is shown that the trigger value of investment is lower when the TNC cooperates with the local partner within the JV than when it undertakes the investment as a wholly-owned subsidiary.

There is a worst case when there is no cooperation and a zero share of the local company in which the JV will only be set up when the profits exceed the quadratic relative markup that is optimal for a vertically integrated company. In this case namely, the TNC waits until the project value exceeds the transfer price charged by the local company by a certain markup, while the local company adds the same mark-up to the cost of investment in order to fix the transfer price.

Kogut (1989) found that a joint venture is often followed by a sale of the local partner's share to the MNE. In our analysis, we neglected the sequential option to acquire the local company that accompanies the equity JV. Under a licensing agreement, the MNE foregoes the option to acquire. Therefore, the MNE may want to wait until the project value reaches the trigger value of an equity JV, and ignore licensing. When the project value increases, the trigger value of a wholly-owned subsidiary may be reached and the MNE will decide to buy the share of the foreign partner. Hence, when the sequential option to acquire the local company is included, the optimal policy will not be to have a zero share, but to have a small positive share. This sheds other light on the conjecture of Svesjnar and Smith (1984) that a JV will refrain from a zero share because a low equity share would alert the host government to the problem of tax avoidance.

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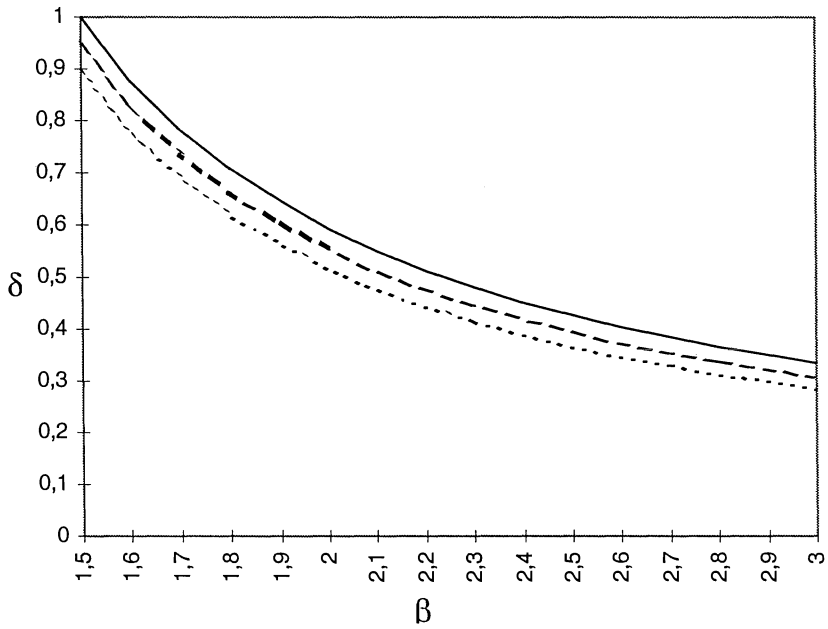

Figure 1: Optimal profit share of the TNC for different values of β and τ (dotted line: τ=0.1; dashed line: τ=0.3; solid line: τ=0.5).

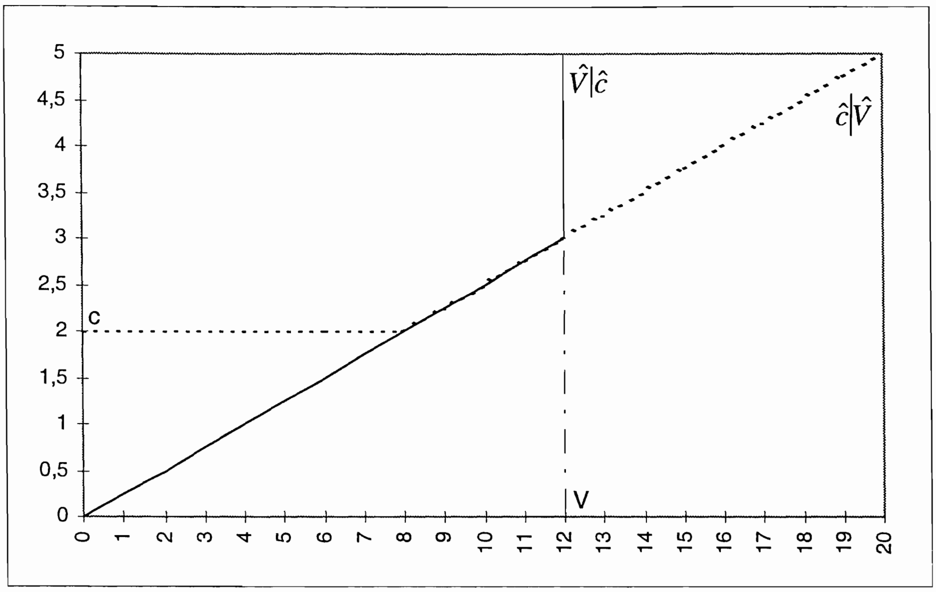

Figure 2.1: Reaction functions for the TNC and the local company. Parameter values:

V=12, c=2, β=2, V*=8. Nash equilibria: $8 \le \hat{V} \le 12; \hat{c} = \frac{1}{4}\hat{V}$.

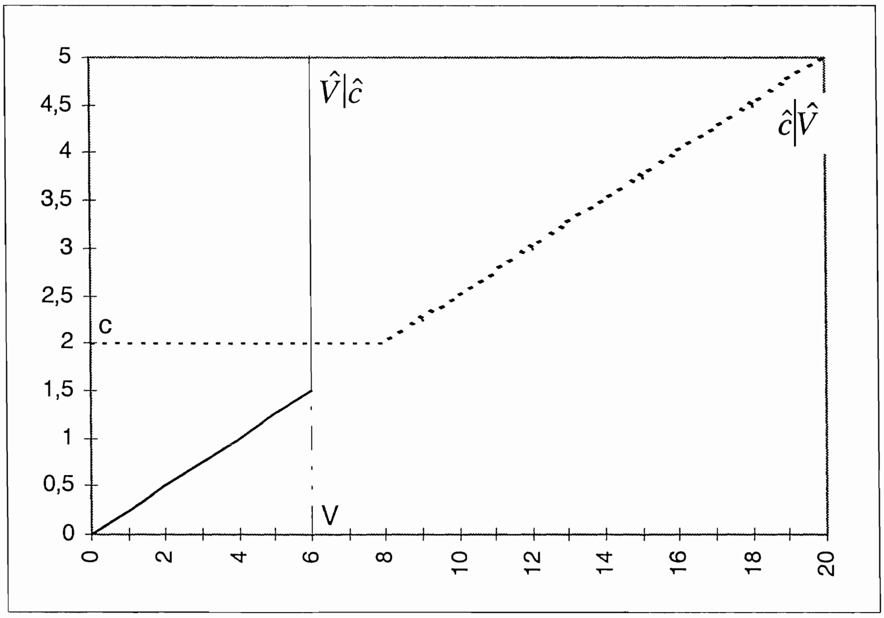

Figure 2.2: Reaction functions for the TNC and the local company. Parameter values:

V=6, c=2, β=2, V*=8. Unique Nash equilibrium: $\hat{V} = 6; \hat{c} = 2$.

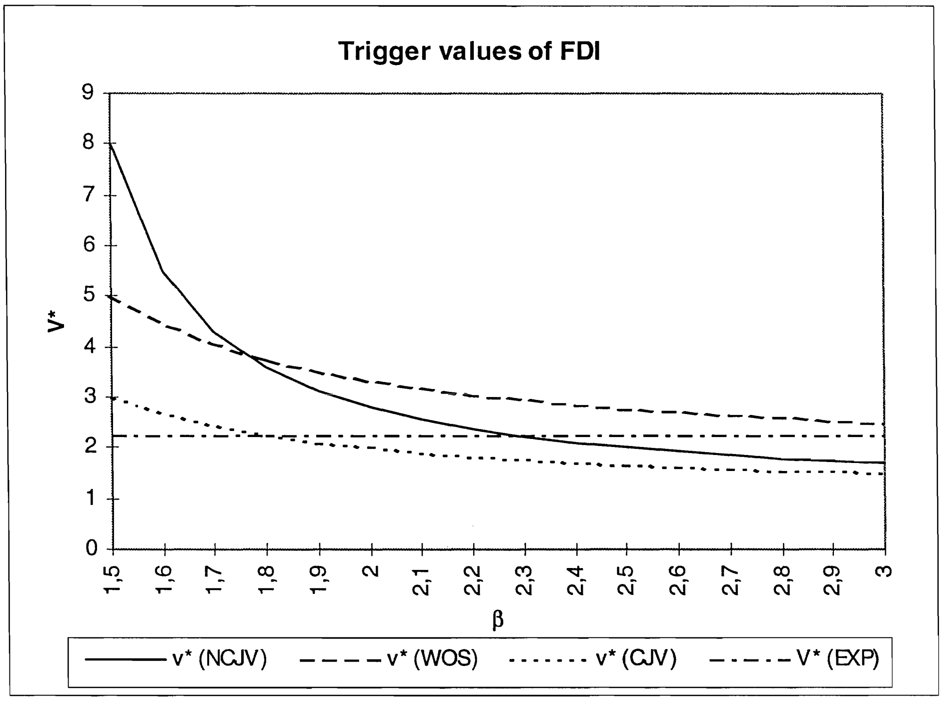

Figure 3: Trigger values for a non-cooperative joint venture (NCJV), a wholly-owned subsidiary (WOS), a cooperative joint venture (CJV), and exporting (EXP).